Emery-Dreifuss muscular dystrophy

Emery-Dreifuss muscular dystrophy is a condition that chiefly affects muscles used for movement (skeletal muscles) and heart (cardiac) muscle. Among the earliest features of this disorder are joint deformities called contractures, which restrict the movement of certain joints. Contractures become noticeable in early childhood and most often involve the elbows, ankles, and neck. Most affected individuals also experience slowly progressive muscle weakness and wasting, beginning in muscles of the upper arms and lower legs and progressing to muscles in the shoulders and hips.

Almost all people with Emery-Dreifuss muscular dystrophy have heart problems by adulthood. In many cases, these heart problems stem from abnormalities of the electrical signals that control the heartbeat (cardiac conduction defects) and abnormal heart rhythms (arrhythmias). If untreated, these abnormalities can lead to an unusually slow heartbeat (bradycardia), fainting (syncope), and an increased risk of stroke and sudden death.

The types of Emery-Dreifuss muscular dystrophy are distinguished by their pattern of inheritance: X-linked, autosomal dominant, and autosomal recessive. Although the three types have similar signs and symptoms, researchers believe that the features of autosomal dominant Emery-Dreifuss muscular dystrophy are more variable than the other types. A small percentage of people with the autosomal dominant form experience heart problems without any weakness or wasting of skeletal muscles.

Frequency

X-linked Emery-Dreifuss muscular dystrophy is the most common form of this condition, affecting an estimated 1 in 100,000 people. The autosomal recessive type of this disorder appears to be very rare; only a few cases have been reported worldwide. The incidence of the autosomal dominant form is unknown.

Genetic Changes

Mutations in the *EMD* and *LMNA* genes cause Emery-Dreifuss muscular dystrophy.

The *EMD* and *LMNA* genes provide instructions for making proteins that are components of the nuclear envelope, which surrounds the nucleus in cells. The nuclear envelope regulates the movement of molecules into and out of the nucleus, and researchers believe it may play a role in regulating the activity of certain genes.

Most cases of Emery-Dreifuss muscular dystrophy are caused by mutations in the *EMD* gene. This gene provides instructions for making a protein called emerin, which appears to be essential for the normal function of skeletal and cardiac muscle. Most

EMD gene mutations prevent the production of any functional emerin. It remains unclear how a lack of this protein results in the signs and symptoms of Emery-Dreifuss muscular dystrophy.

Less commonly, Emery-Dreifuss muscular dystrophy results from mutations in the *LMNA* gene. This gene provides instructions for making two very similar proteins, lamin A and lamin C. Most of the *LMNA* mutations that cause this condition result in the production of an altered version of these proteins. Researchers are investigating how the altered versions of lamins A and C lead to muscle wasting and heart problems in people with Emery-Dreifuss muscular dystrophy.

Inheritance Pattern

Emery-Dreifuss muscular dystrophy can have several different patterns of inheritance. When this condition is caused by mutations in the *EMD* gene, it is inherited in an X-linked recessive pattern. A condition is considered X-linked if the mutated gene that causes the disorder is located on the X chromosome, one of the two sex chromosomes. In males (who have only one X chromosome), one altered copy of the gene in each cell is sufficient to cause the condition. Males are affected by X-linked recessive disorders much more frequently than females. A characteristic of X-linked inheritance is that fathers cannot pass X-linked traits to their sons.

In females (who have two X chromosomes), a mutation typically must be present in both copies of the *EMD* gene to cause X-linked Emery-Dreifuss muscular dystrophy. Females who carry one altered copy of the *EMD* gene usually do not experience the muscle weakness and wasting that are characteristic of this condition. In some cases, however, they may experience heart problems associated with this disorder.

Other cases of Emery-Dreifuss muscular dystrophy result from mutations in the *LMNA* gene and are considered to have an autosomal dominant pattern of inheritance. Autosomal dominant inheritance means one copy of the altered gene in each cell is sufficient to cause the disorder. About 75 percent of autosomal dominant Emery-Dreifuss muscular dystrophy cases are caused by new mutations in the *LMNA* gene and occur in people with no history of the disorder in their family. In the remaining cases, people with this form of the condition inherit the altered *LMNA* gene from an affected parent.

Rarely, *LMNA* gene mutations can cause a form of Emery-Dreifuss muscular dystrophy that is inherited in an autosomal recessive pattern. Autosomal recessive inheritance means two copies of the gene in each cell are altered. Most often, the parents of an individual with an autosomal recessive disorder are carriers of one copy of the altered gene but do not show signs and symptoms of the disorder.

Other Names for This Condition

- Benign scapuloperoneal muscular dystrophy with early contractures
- EDMD
- Emery-Dreifuss Syndrome
- Muscular Dystrophy, Emery-Dreifuss

Diagnosis & Management

Genetic Testing

- Genetic Testing Registry: Benign scapuloperoneal muscular dystrophy with cardiomyopathy
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0410190/
- Genetic Testing Registry: Emery-Dreifuss muscular dystrophy
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0410189/
- Genetic Testing Registry: Emery-Dreifuss muscular dystrophy 1, X-linked
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0751337/

Other Diagnosis and Management Resources

- GeneReview: Emery-Dreifuss Muscular Dystrophy
  https://www.ncbi.nlm.nih.gov/books/NBK1436
- MedlinePlus Encyclopedia: Arrhythmias
  https://medlineplus.gov/ency/article/001101.htm
- MedlinePlus Encyclopedia: Contracture deformity
  https://medlineplus.gov/ency/article/003185.htm
- MedlinePlus Encyclopedia: Muscular dystrophy
  https://medlineplus.gov/ency/article/001190.htm

General Information from MedlinePlus

- Diagnostic Tests
  https://medlineplus.gov/diagnostictests.html
- Drug Therapy
  https://medlineplus.gov/drugtherapy.html
- Genetic Counseling
  https://medlineplus.gov/geneticcounseling.html

- Palliative Care
  https://medlineplus.gov/palliativecare.html
- Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html

Additional Information & Resources

MedlinePlus

- Encyclopedia: Arrhythmias
  https://medlineplus.gov/ency/article/001101.htm
- Encyclopedia: Contracture deformity
  https://medlineplus.gov/ency/article/003185.htm
- Encyclopedia: Muscular dystrophy
  https://medlineplus.gov/ency/article/001190.htm
- Health Topic: Arrhythmia
  https://medlineplus.gov/arrhythmia.html
- Health Topic: Muscular Dystrophy
  https://medlineplus.gov/musculardystrophy.html

Genetic and Rare Diseases Information Center

- Emery-Dreifuss muscular dystrophy
  https://rarediseases.info.nih.gov/diseases/6329/emery-dreifuss-muscular-dystrophy

Educational Resources

- Disease InfoSearch: Benign scapuloperoneal muscular dystrophy with cardiomyopathy
  http://www.diseaseinfosearch.org/Benign+scapuloperoneal+muscular+dystrophy+with+cardiomyopathy/7808
- Disease InfoSearch: Emery-Dreifuss Muscular Dystrophy
  http://www.diseaseinfosearch.org/Emery-Dreifuss+Muscular+Dystrophy/2510
- MalaCards: emery-dreifuss muscular dystrophy
  http://www.malacards.org/card/emery_dreifuss_muscular_dystrophy
- Orphanet: Emery-Dreifuss muscular dystrophy
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=261

Patient Support and Advocacy Resources

- Muscular Dystrophy Association
  https://www.mda.org/disease/emery-dreifuss-muscular-dystrophy
- National Organization for Rare Disorders (NORD)
  https://rarediseases.org/rare-diseases/emery-dreifuss-muscular-dystrophy/
- Resource list from the University of Kansas Medical Center
  http://www.kumc.edu/gec/support/muscular.html

GeneReviews

- Emery-Dreifuss Muscular Dystrophy
  https://www.ncbi.nlm.nih.gov/books/NBK1436

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Muscular+Dystrophy,+Emery-Dreifuss%5BMAJR%5D%29+AND+%28Emery-Dreifuss+muscular+dystrophy%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1440+days%22%5Bdp%5D

OMIM

- EMERY-DREIFUSS MUSCULAR DYSTROPHY 1, X-LINKED
  http://omim.org/entry/310300

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  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1288205/

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